

Beyond shopping decisions, there are preparation techniques for grains and legumes that will help all those minerals from your organic garden get into your body. For no other food group is preparation as important as it is for the grain and legume families.

## NUTRIENT LOSS IN MILLED GRAIN

Most of us have gotten the memo that white flour and rice are not very healthy. Their high glycemic content can raise our blood sugar and add to our waists. They do not help us in our depression battle either—note the loss of vitamin B-6 and minerals in the table below.

Processed white flours and refined grains, including the sumptuous bed of white rice in your sushi, have been stripped of much of their nutrition. Begin to replace some of these items with the whole grain version.

<b>Table 12.1: Refined wheat flour and nutrient loss</b>	
	<b>% loss (compared to whole wheat)</b>
B-6	82.3 <sup>a</sup>
Zinc	77.7 <sup>b</sup>
Magnesium	84.7 <sup>b</sup>
Iron	75.6 <sup>b</sup>
Calcium	60.0 <sup>b</sup>
<i>a</i> Schroeder 1971 <i>b</i> Czerniejewski et al. 1964	

## PHYTIC ACID AND MINERAL ABSORPTION

In the research for this book I was struck by the solid research about phytic acid and yet the American public's relative lack of knowledge about its effects. I certainly never heard about them in my vegetarian days, yet they have profound implications for the vegetarian diet. Some nutritionists estimate

that vegetarians whose primary source of protein comes from grains and legumes absorb only about 15 percent of the minerals in those foods. Based on the research I present here, that is a fair estimate, though absorption from soy-based foods is even lower. If you are a vegetarian, you can very quickly double the minerals you are absorbing by using the techniques I describe.

### *Phytates Matter*

Whole grains and fresh legumes are problematic, unfortunately, because of their naturally high level of phytic acid, which inhibits the absorption of key minerals that we are trying to increase in our diets: iron, zinc, and magnesium specifically. Phytic acid binds to minerals in your digestive tract and escorts them out through your bowels. There will be no cell building with these minerals, even though the label on the grain or legume suggests you are eating mineral-rich food. Research has shown that phytates inhibit the absorption of significant levels of minerals in the phytate-laden food. The iron in your soybean will not help rebuild your body if you do not break down the phytic acid first.

Researchers have conducted experiments on mineral absorption that show clearly that phytates matter. A study of iron absorption in cereal porridges found in some cases a twelve-fold increase in the absorption of iron when the phytic acid was removed from the food. Participants absorbed only about 1 percent of the iron in their wheat porridge but that absorption rate increased to 12 percent when the phytic acid was removed (Hurrell et al. 2003).

Another set of experiments examined depression-fighting zinc and magnesium. Researchers provided two groups of people with bread—one group with a bread with phytates and one with a control bread with the phytates removed. Researchers then studied participants' mineral absorption via stool samples. Without phytic acid, participants absorbed about 30 percent of magnesium and zinc. With phytic acid, participants absorbed only 13 percent of their magnesium and 23 percent of their zinc (Egli et al. 2004; Bohn et al. 2004).

These results make clear that even in products lower in phytic acid, we can absorb about 50 percent more minerals if we can reduce the phytate content to zero. In higher-phytate foods such as soybeans and whole wheat,

we might more than double our absorption of minerals if we can reduce the phytate levels to zero.

### *The Solution in Your Kitchen*

Some grains and legumes are high in phytates, some are low. As a class, milled grains such as white flour are low in phytates. Do not worry about phytates in your white flour (and you are cutting back on that anyway). For our purposes here, what turns out to be the more important question is how to reduce the phytic acid content of our foods and what grains and legumes prove to be wily exceptions to these techniques.

### *Rise Time, Soaking, and Sprouting: Putting the enzyme phytase to work for you*

For the most part, if grains and legumes are allowed to sit and stew for a while in warm water with a slightly acid medium, their phytic acid level will decline. These techniques will fight your phytates:

- 1) Take advantage of bread rising time. As yeast bread dough sits and is allowed to rise, the phytic acid content will be reduced. Sourdough techniques are generally the most effective if only because the rise time tends to be longer and the lactic acid in the starter breaks down the phytates.
- 2) Use sourdough techniques for flatbreads, quick breads, pancakes, and waffles. We turn every quick bread into a sourdough around here.
- 3) Soak grains for porridges. Your breakfast porridge should be soaked in advance of cooking, as should grains to be used in dishes such as tabouli. Ground grains are preferable to whole kernels since the phytic acid breaks down easier. Follow these steps:
  - a. Soak in water, about equal parts water to grains (enough to cover them well).
  - b. The water temperature should be between 45°C and 55°C (113°F-131°F), just above body temperature.

- c. Add an acidic ingredient to water to achieve a pH level of 4.5 to 5.5. For best results use whey, yogurt, or kefir (approximately two tablespoons per cup of grain). Otherwise add about two tablespoons of lemon juice per cup of grain.
  - d. Cover with a clean dishcloth to keep the bugs out.
  - e. Soak in a warm spot for at least two, and at best, twelve hours.
- 4) Germinate grains and legumes. Make sprouts to reduce phytic acid. Sprouted grains are used in higher-end health breads increasingly. These are great options particularly for flat breads such as tortillas and pizza crusts. Germinating will increase the folate content as well.
  - 5) Soak your beans in very warm water (140°F) for about eighteen hours in a warm spot. I start mine one morning and cook them the following afternoon.

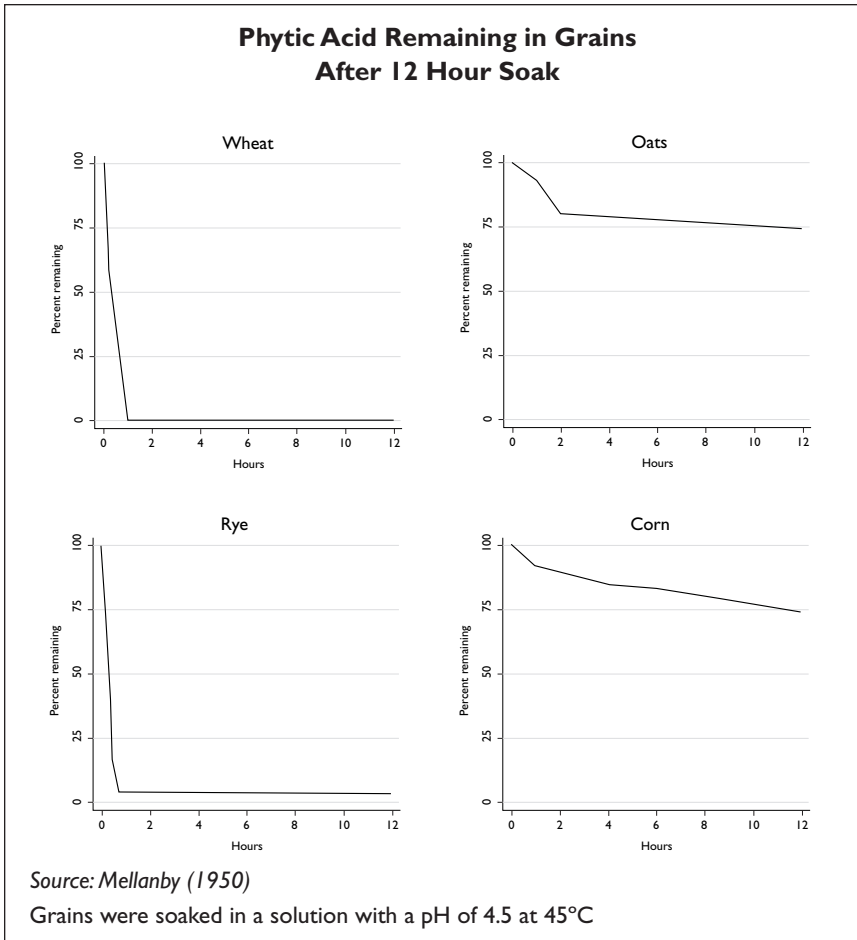
You will find a fairly extensive discussion of each of the above five areas on my Web site.

### ***Oats, Corn, and Complementary Soaking***

If you eat a lot of oatmeal or corn, keep reading. You need to know that the basic techniques to reduce phytates are not very effective in these two cases. Oats, corn, soy, millet, and sorghum are known to be low in phytase, the enzyme that breaks down the phytic acid. I focus on oats and corn here because they are the most common. I address soy afterward.

In a 1950 study, Mellanby reported an experiment reducing the phytic acid content of various grains, which I present in the following figure. Note that with rye and wheat it takes only two hours to reduce the phytate content under optimum conditions. With oats and corn, soaking for twelve hours is insufficient—the phytic acid levels are still about 75 percent of their original levels.

There is a fairly simple solution when making oatmeal: use about 10



percent fresh ground wheat and follow the instructions I provided earlier on soaking. Grind this small amount of wheat in your coffee grinder, if you do not have a grain mill. (For larger quantities, purchase a grain mill before you burn out your coffee grinder.)

Many corn items, such as corn bread, contain wheat and, thus, make use of grain combining. However, corn products from masa such as corn tortillas, corn tortilla chips, and tamales are made from a corn dough that has been nixtamalized. The corn is soaked in lime to improve the bioavailability of niacin. This preparation process reduces the level of phytic acid by only about 20 percent (Bressani et al. 2004).



### Make One Change with Breakfast

Replace your breakfast cereal with whole grain, ground porridge. Soak that porridge overnight according to the process described in this section.

You will benefit twice: (1) by replacing a processed cereal with a whole grain alternative, and (2) by reducing the phytate content of that cereal grain.

It's fast. Because of the soaking, your breakfast cereal will cook in one to two

minutes, making it a fast and easy breakfast solution.

Add fat. Use butter from grass-fed cattle. The fat will help your body absorb the minerals in the cereal and will add Omega-3 fatty acids to your meal.

And when you're feeling ambitious: buy the whole grain kernel and grind your cereal grains just before soaking.



You could purchase nixtamalized corn and soak it in an acid solution to reduce the phytates further, but with limited kitchen time, your best strategy is to rely on other foods for their minerals rather than the corn product.

### *Soy and its Unavailable Minerals*

In this house, soy products used to be a staple. We valued them for their low cost and high protein and mineral content. One of those 12-ounce tubs of tofu has 100 milligrams or so of magnesium. That is 25 percent of the DRI of magnesium. It is too bad that only about 10 milligrams are absorbed into your body. To make matters worse, there is some discussion in the nutrition literature that the phytic acid in soy may make soy protein less useable for our bodies (Reddy et al. 1989, 57–69).

A study of phytic acid in soybeans documents in detail the phytic acid level at different stages of preparation. The researchers boil the beans, pour off the water, soak them again, dehull them, steam them, drain them, and cool them. The phytic acid levels change very little with all this effort.

It is only when they ferment the beans in the form of tempeh that the phytate levels reduce to about 45 percent of the levels of the soaked soybean. Fried tempeh is an improvement still, but if the tempeh is stored for two

weeks at 5°C and then fried, the researchers reached the optimal (but not perfect) reduction of the phytic acid (Sutardi and Buckle 1985). A 2003 study also found that the phytic acid level decreased by only 31 percent by fermenting soybeans (Egounlety and Aworth 2003).

Keep these results in mind as you shop for soy milk and tofu. Soybeans in soy milk are soaked, strained, and cooked. Tofu has an additional step—a coagulant is added. Both of these products retain nearly 100 percent of the phytates. Eat tempeh for a soy fix, but eat it sparingly if you do not prepare it yourself and do not know that traditional preparation methods were used. Soybean fans should learn to ferment soybeans in their own home using traditional fermentation techniques.

People who make their own soy milk and tofu might be able to improve them, if not through fermentation techniques, by soaking them with a high-phytase grain such as wheat. Researchers have combined grains and legumes strategically to reduce the phytates in one item with the phytase in another. In the case of soybeans, researchers included only 20 percent soy and 80 percent wheat. They successfully reduced the phytic acid in the porridge. Homemade milk aficionados might use a similar strategy. There is no research that I am aware of that would direct us with the proper ratio of soybeans to wheat to make a soy milk. I do not eat soy—this is an idea for experimental cooks who do.

### *Alternative Milks*

Speaking of soy milk, phytates are a problem in all the alternative milk products available in the market place except perhaps rice milk made from white rice (which we are reducing in our diet anyway). Brown rice, nuts such as almonds, and soy all have phytic acid. If I relied on alternative milks for their nutrients, I would try to make them myself. I would use the soaking strategy for rice I outlined earlier or for nuts and seeds that I outline in the next chapter and then follow the usual process for making these milks.

### *Phytates Can Be Therapeutic*

There is increasing discussion in research that phytates play a role in cancer prevention. Indeed, the bad news about phytates is that they inhibit mineral absorption. The good news about phytates is that they inhibit mineral absorption. Sometimes it is all about perspective. Here is the key question: What is more important for you now, increasing your body levels of magnesium and zinc or decreasing your levels of iron? For younger women reading this book, low iron is more likely a problem than high iron. For women who are post-menopausal, high iron may be a problem (but then again, low iron may still be a problem). Excess iron is implicated in disease as well and including phytates in your diet is an effective way to reduce your body's iron levels. Depending on your own circumstances and stage in the life cycle, your needs are going to be different. Pick and choose the food preparation suggestions in this chapter accordingly.

## TO-DO LIST: GRAINS AND LEGUMES

- For flat breads such as tortillas, pocket bread, pizza crust, pancakes, and waffles find sprouted or sourdough varieties.
- Turn quick breads into sourdough breads using our cheaters' methods.
- Soak your breakfast porridge or your grain dish (about 120°F with a bit of yogurt or lemon juice for two to twelve hours).
- In porridges, eat ground grains instead of whole kernels.
- Add rye flakes to your oatmeal before soaking.
- Soak legumes for eighteen hours in very warm water (140°F) before cooking.
- Eat fermented soybeans in the form of tempeh or combine your soybeans with a high-phytase grain.